Foundry Solutions, *Personalized*

BROADSHEET

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GREEN SAND ADVISORY

WOOD FLOUR

AS AN ADDITIVE IN GREEN SAND MOLDING

- **Wood Flour :**
  Finely ground wood particles that maintain the composite nature of wood (cellulose + hemicellulose + lignin + minor components)

Introduction:

Green sand is the lowest cost mold preparation process used in iron casting. The moisture content in moulding sand is never fully 'cured' during the casting process leading perhaps to its description as 'green' sand. Just as in cement preparation; until the cement is fully dried/cured, it is said to be in a green state which means it is still pliable/mouldable and capable to taking a shape of a pattern pressed onto it (such as a careless foot print on freshly spread cement).

Context of this Broad Sheet:

One of greensand's highest variability is its moisture content. Foundries struggle to maintain their target moisture for the sand mould in face of several variables such as:

01. Varying return sand moisture content due to equally varying patterns/components;
02. RH and ambient temperatures,
03. Varying core sand influx;
04. Lack of return sand data, etc.

In absence of good moisture control there is inevitably presence of 'free moisture' in the sand.

In order to smoothen the free moisture in the sand, wood flour, which is a passive, naturally occurring fibrous material devoid of significant reaction to changing seasons and environmental conditions is well documented.

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It also serves three significant purposes:

01. It spreads out the moisture particles thereby preventing localised moisture rich spots which can cause penetration and explosion defects.
02. It also serves as a spot repository of moisture enabling adjacent bentonite particles to continue to develop through the mould life-cycle until pouring of metal.
03. The inert nature of this natural, partial cellulose type material, is that it absorbs some heat and may assist also in smoothening out the hot sand by dissipating the heat somewhat like a heat exchanger.

Note: There is no direct scientific research to substantiate the above claims but it is in the direct domain of common sense and surface area technology.

The above benefits are in addition to the following advantages as direct benefits:

- **Collapsibility:** This is the primary function. When molten metal is poured into the mould, the radiant heat causes the wood flour (a combustible material) to burn away, leaving behind small voids or empty spaces between the sand grains. This creates room for the sand grains to move, facilitating collapsibility during shakeout.
- **Thermal Expansion Control:** The space thus created between sand grains, allows for expansion and consequently reduces mould wall movement. This helps to minimize defects like scabbing and buckling that occur due to thermal expansion of the sand in highly dense molds.
- **Permeability:** The burning of the wood flour creates pores, which can secondarily assist with permeability. Primary factors like GFN and its distribution which have a more direct impact on this property.
- **Green Strength and Hot Strength:** Wood flour does not significantly enhance green strength or hot strength. Its inert surface characteristics is the mechanism by which it improves collapsibility.

Modern High Pressure and High Density Moulding have no doubt changed the additive requirement characteristics as well as dosage needs. However, a highly dense mould needs to have some 'elbow' room for the expansion of sand which is an unavoidable nature of the process. Hence the author is of the opinion that different geographies which use different characteristics of sand as-available, and clay requirements which vary significantly, one must not be averse or resistant to concept of using additives tailored to local requirements. The main objective variable being good casting outcomes.

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